Mexico, 1 August 1954 (M. Cazier, W. Gertsch, Bradts); 1 male, 3 miles NW. Totalapan, Oaxaca, Mexico, 6 July 1958 (Univ. Kansas Mex. Expedition).

The confluently punctate, subopaque pronotum, shining elytra, and dual type of pubescence will readily separate *A. nitidipennis* from other known species of *Anelaphus*.

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Observations of the Nesting Habits of *Euparagia scutellaris* Cresson

(Hymenoptera : Masaridae)

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Discovery of a colony of the rare masarid wasp *Euparagia scutellaris* Cresson in June 1966, at the University of California's Sagehen Creek Station, prompted a review of the published literature on this species. We found that little is known about *Euparagia* life hisory except for *E. scutellaris* which Williams (1927) first observed nesting in hard ground in the vicinity of Lake Tahoe, California. The nest of each wasp was "surmounted by a delicate and slender curved tube of clay." These nests were provisioned with curculionid larvae, questionably determined as *Ceutorhynchus* sp. This predatory habit is particularly interesting since it is the only one known in the family Masaridae, all of the other members collecting nectar and pollen.

The genus *Euparagia* consists of seven described species and is confined to the southwestern United States (California, New Mexico, Texas, Arizona, Nevada) and northern Mexico (Richards, 1962). Bohart (1948) referred to the plants visited by *Euparagia*. These included *Eriogonum trichopodum*, *E. trichopes*, *E. inflatum*, *E. reniforme*, *Euphorbia*, *Croton*, and *Larrea*. In personal communication with R. M. Bohart, he mentioned collecting *Euparagia* on *Oenothera* and *Calochortis*.

All known species of the genus are small and stout. They are dis-

tinguished from other Vespoidea by the position of their wings which are not folded longitudinally when at rest, and by the presence of a basal ring on the midfemur (absent in all other masarids). In the family Masaridae there are two submarginal cells in the forewing except in the Gayellinae and Euparagiinae which have three cells. The dorsal margin of the clypeus in Euparagiinae is nearly straight, whereas in Gayellinae it is bisinuate.

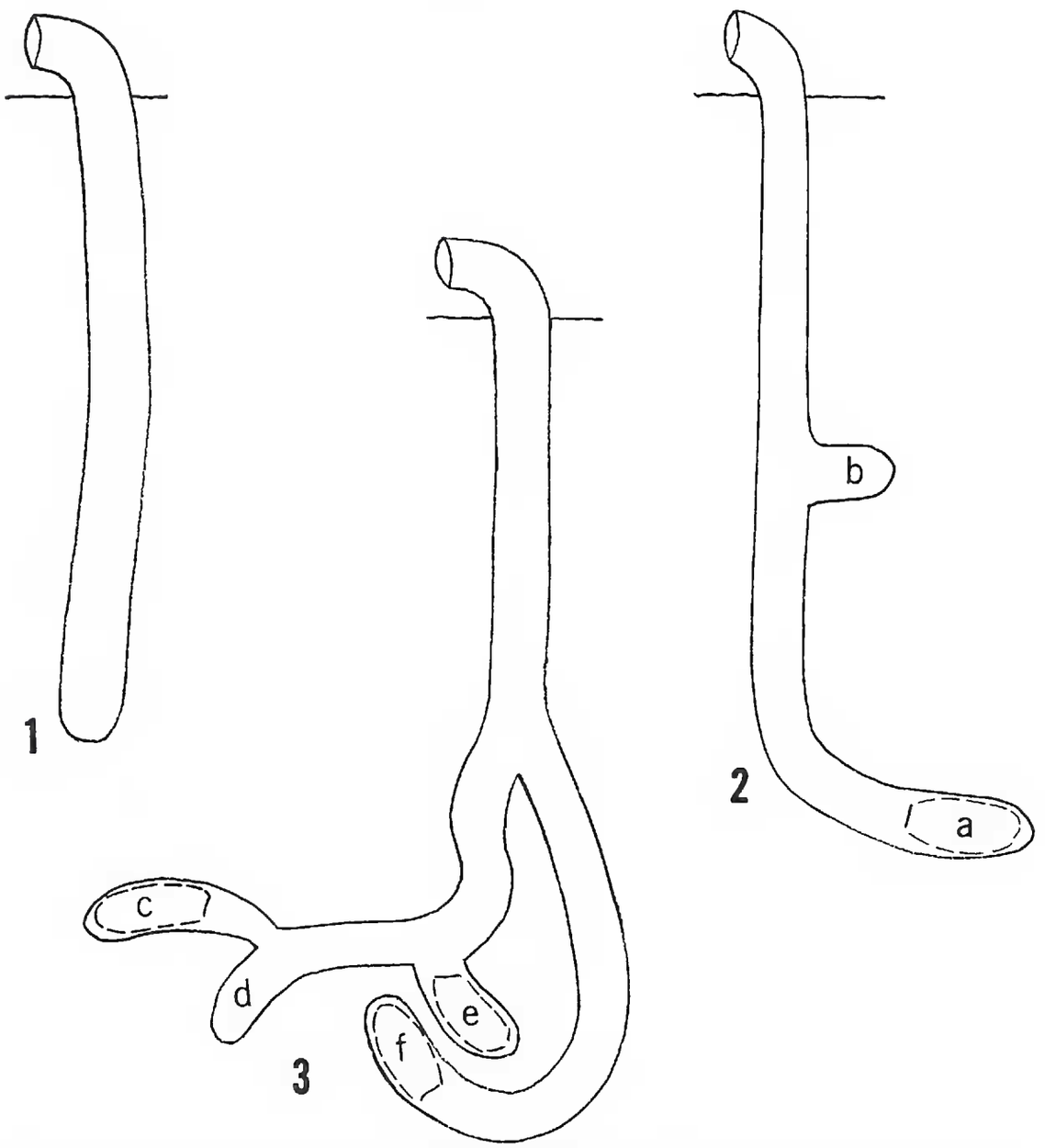
The nesting site studied was located on a graded bank between two dirt roads. Near one edge of the site was a well traveled footpath. The soil was mainly hard packed loam of volcanic origin and was intermingled with small rocks. A total of 24 nests were built within the nesting site which was approximately five feet in diameter and twenty square feet in area. The distance between most turrets ranged from two to twelve inches, but, in one instance, three turrets were constructed touching one another.

When excavating the nest a female wasp took most of the smaller earth particles to the ground surface and deposited them outside the entrance. Larger sand grains and small pebbles were taken out of the burrow in the mandibles and deposited during a circular flight a few feet from the entrance. No cementing material was utilized in the primary or secondary tubes, but the provisioning chambers were sealed with moist soil particles.

In building a turret, material excavated from the burrow was used. The female wasp apparently mixed small quantities of saliva with the soil particles, which included fine grained clay as well as coarse sand. Then, using her mandibles, legs, and the tip of the abdomen, these moist particles were built up around the circumference of the opening by the wasp. After completing a section of approximately 1–2 square mm the wasp re-entered the burrow and the process was repeated.

A complete turret took approximately 30 minutes to build and was constructed after the burrow was partially excavated. When an unfinished turret was destroyed, the female immediately began a new one which duplicated the original almost exactly. If a completed turret was destroyed during the provisioning process, the wasp was somewhat slow in initiating construction of a second turret. When finally started, the new turret was only partially rebuilt.

The turret appeared to serve as a primary landmark. In one instance, we detached an entire turret from its original site over a burrow and moved it one-quarter inch to one side, making sure the turret was oriented in its original direction. The returning female wasp immediately entered the detached turret when there was, in fact, no burrow under-



Figs. 1–3. Burrow diagrams of *Euparagia scutellaris* Cresson (life size). Fig. 1. Six day old burrow. Fig. 2. Fourteen day old burrow. *a*, sealed chamber: 12 weevil larvae, 1 wasp larva; *b*, recently initiated cell or burrow branch. Fig. 3. Twenty-one(+) day old nest. *c*, sealed chamber: 32 weevil larvae, 1 wasp larva; *d*, unsealed chamber: 9 weevil larvae (no wasp larva); *e*, sealed chamber: 21 weevil larvae, 1 wasp larva; *f*, sealed chamber: *E. scutellaris* prepupa.

neath. The wasp appeared confused for several minutes until she discovered her burrow.

Several burrows of known ages were dug up and examined during our observations. In general, the burrows consisted of a single, straight tube from which provisioning chambers or other tubes radiated. The nature of the soil appeared to dictate the direction of the branches as well as the location of the provisioning chambers. Of the burrows examined, we did not find many nests which exceeded 60 mm in depth.

Figs. 1, 2, and 3 illustrate 6, 14, and 21(+) day old nests respectively. The six day old nest (fig. 1) showed no signs of provisioning, although a slight enlargement at the terminus suggested a possible chamber under construction. A fourteen day old nest (fig. 2) had one sealed chamber (a) which contained 12 weevil larvae and a wasp larva; another cell or burrow branch (b) was apparently just being initiated. Older nests of about twenty-one days or more consisted of a number of chambers in various stages of development. In fig. 3, for example, two sealed chambers (c and e) contained 32 and 21 weevil larvae respectively (one wasp larva in each cell); another sealed chamber (f) held a prepupa of *E. scutellaris*. An unsealed cell (d) contained 9 weevil larvae but no wasp larva, suggesting that this chamber was still being provisioned.

The provisioning chambers were only slightly larger in diameter than the 3 mm primary tunnel and were randomly located. Prey collected from these chambers consisted exclusively of curculionid larvae of the genus *Anthonomus* (det. W. H. Anderson, USDA). These were brought in one at a time and were carried primarily in the mandibles. A wasp did not usually pause before alighting at the turret entrance with its prey, and when entering the burrow, less than 30 seconds was generally spent depositing the prey. As many as 30 or more curculionid larvae were placed in some chambers. After a cell was provisioned, the wasp laid her egg, sealed up the chamber, and then excavated and provisioned another chamber.

Formica lasioides, *F. fusca*, and *Mantica mutica* (det. G. C. & J. Wheeler, University of North Dakota), were frequent ant visitors around the wasp nests; while none were observed entering any of the burrows, *M. mutica* did construct several nests in the midst of the wasp colony. A female chrysidid, *Chrysis submontana* Rohwer (det. R. M. Bohart), was observed in close proximity to the burrows. Whether it successfully parasitized any of the *Euparagia* is unknown.

We would like to thank Dr. R. M. Bohart, University of California, Davis, for suggesting this study and for reviewing the manuscript.

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